

active and laying eggs for the next brood of white grubs. These well-known beetles spend the night in trees, where they feed on the young foliage. The females fly down to the turf particularly in the early-morning hours just before daylight, immediately burrow into the soil and deposit eggs. In a comparatively short time these eggs hatch and the young grubs start feeding on the grass roots, and become most destructive the following year. If they are sufficiently abundant, they greatly weaken or even kill the turf grasses.

These beetles seem to prefer the white or burr oak foliage and therefore are most abundant in groves of these trees. They are also found in such trees as hickory, poplar, elm, willow, locust, ash and walnut. The females ordinarily

do not fly far from the trees they inhabit. Therefore, the area of greatest grub infestation is invariably in the immediate vicinity of trees which have been heavily populated by beetles.

At this season of the year it is well to have members of the greenkeeping staff on the lookout for these beetles. The beetles fly to the trees about dusk and, if numerous, with the aid of a flashlight they may be seen flying around the trees during the early evening. Wherever they are observed in large numbers, it is well to anticipate grub injury within the next few months. Important turf in such infested areas may be treated with arsenate of lead at the rate of 5 pounds to 1,000 square feet during the summer to poison the young grubs before they do serious damage to the turf.

Questions and Answers

While most of the answers are of general application, it should be remembered that each recommendation is intended specifically for the locality designated at the end of the question.

Fairway Mowing Height

Q.—Shall we set our mowers as close as one inch for cutting fairways and lawns? (Ohio.)

A.—In general we find that bluegrass and fescue on fairways have been cut too close. Our recommendation is that mowers be set as high as the golfers will permit. The higher the fairway grass is cut, the better it will withstand adverse conditions. There naturally is a limit to the height that can be tolerated on fairways. Since this height is below that which is best from the standpoint of the grass, we make no specific recommendation as to height but simply urge that the mowers be raised as far as the players will allow, realizing that this will be decidedly different on various golf courses. Our experience has been that as the mowers are gradually raised, the players will tolerate longer grass and will actually find that the playing conditions will be greatly improved even though the roll of the ball will be less.

Old and New Stolons

Q.—Are stolons from a creeping bent nursery two years old as satisfactory as those from a new nursery? (Delaware.)

A.—Our experience has been that stolons from old nursery rows are somewhat slower in becoming established than stolons from new nursery rows. When once established, however, there is no apparent difference between the turf produced from stolons from old and new rows, provided there has been no heavy growth of seedling bent.

Home-Mixed Fertilizers as Compared with Commercial Fertilizers

Q.—What is your opinion as to the advisability of our mixing our own fertilizers? We are thinking of using a 6-12-4 fertilizer this season and are anxious to reduce its cost as much as possible. We are told by dealers that our own mixing will not be satisfactory, since prepared fertilizers sold by dealers contain many chemicals which grasses need which cannot satisfactorily be supplied when one attempts to make his own mixtures. (New York.)

A.—Apart from nitrogen, phosphorus, potash and calcium, plants use only minute quantities of other elements which commercial fertilizers contain. Except in special cases, soils throughout the northern humid area contain plenty of these rare elements, and hence they need not be considered in fertilizer practice in your part of the country. We have used a 6-12-4 fertilizer in our demonstration gardens and found it did very well for general fertilizing of both fairway and putting green turf.

Control of Pearlwort in Putting Greens

Q.—We are seeking information on the extermination of pearlwort in our putting greens. We should like to know what chemicals to use to kill this weed and the best method of applying them. (Oregon.)

A.—Pearlwort is common on courses with poorly drained greens. However, it is sometimes found growing under a wide variety of conditions and may occasionally prove trouble-

some where the best of drainage is provided. If pearlwort is found in a few scattered patches, it can be removed by replacing these areas with clean sod. Where it is growing rather generally over the greens, it would be impractical to plug it out. It would be well under the latter condition to attempt to burn it out with sulphate of ammonia. Pearlwort is more easily injured with this nitrogen fertilizer than turf grasses are, so that by applying enough of the sulphate of ammonia to give a slight burn to the grass the pearlwort will be badly injured. Such treatments repeated from time to time entirely kill out the pearlwort and will not permanently injure the greens, since the grass will quickly recover after each treatment. It is well to watch the progress of the burning closely so that water can be applied in case the turf shows signs of more than mild injury.

Green Dye for Turf

Q.—I should like to try the green dye I saw demonstrated at the Arlington turf garden on greens and should appreciate any information you can give me. (Ohio.)

A.—The use of dye for grass is still in the experimental stage. The dye consists of a combination of Malachite Green, Auramine O and Crystal Violet. The separate ingredients are obtainable from several chemical manufacturers. This dye is apparently perfectly harmless to grass and is not poisonous to man or to animals. Ordinarily one-half ounce dissolved in from two and one-half to 5 gallons of water will be found to give good coverage when sprayed over 1,000 square feet of turf. The dye comes off on balls when it is wet; therefore, it should be applied only at a time when it will dry fairly rapidly.

Chickweed in Putting Greens

Q.—Our putting greens contain many spots of chickweed. We have applied arsenate of lead recently for the control of earthworms. Will arsenate of lead control chickweed? (Indiana.)

A.—In many cases an application of arsenate of lead applied at the rate of five pounds to the 1,000 square feet has been sufficient to check chickweed. The action is a slow one, requiring at least two weeks. This treatment, however, is not always effective.

Repairing Turf Injured by Grubs

Q.—In some of our fairways there are many patches of dead turf where grubs have eaten the roots. I should appreciate your suggestions for repairing this damage and preventing similar grub injury in the future. (New York.)

A.—The injured areas should be seeded as soon as possible and rolled with a spike roller or raked lightly to work the seed into the soil and to aid in germination. If the beetles are abundant generally it would be well to poison all the fairways with arsenate of lead. A rate of five pounds to 1,000 square feet (200 pounds to the acre) is recommended. On some soils this is ample, but on other soils heavier applications may be necessary. If the grubs are found to be active after the treatment, it is an indication that the rate was insufficient for your soil. However, another application may be made before serious injury to turf develops. The effectiveness of the first application may be determined by lifting sods in several places in areas where the beetles have been numerous.

Controlling Annual Bluegrass in Putting Greens

Q.—Several of our bent greens are badly spotted with annual bluegrass and each year this grass is spreading. How should we treat these greens? (Kansas.)

A.—Annual bluegrass (*Poa annua*) is probably the hardest of all grasses or weeds to remove from a putting green; in fact, when it becomes pretty well distributed throughout a green it is less expensive to remove the turf entirely and replant than to try to weed it from the green. When it first appears, turf containing spots of annual bluegrass should be removed and pure bent turf replaced. This is a good method for keeping greens free from it, but is an expensive procedure where conditions are favorable to annual bluegrass. If, however, in the meantime the annual bluegrass has gone to seed, countless seeds will germinate the following spring and fall. In order to prevent a putting green from becoming infested with annual bluegrass, in constructing the green, care should also be taken to see that the compost used for topdressing is free from the seeds of this grass. Methods of obtaining topdressing material free from weed seeds are outlined in The Bulletin of the United States Golf Association Green Section for August and September, 1930. In some places many old greens which are full of annual bluegrass are giving satisfactory results.

Inexpensive Fertilizing Material

Q.—I have recently been fortunate in obtaining a good supply of hen droppings from a neighbor close by the club for the cost of carting it away. To date I have worked them in the compost pile. I plan to spread the droppings on the fairways, let them dry, and then drag a mat by means of the tractor to work them in. Will there be any danger from a burn? (Massachusetts.)

A.—The hen manure you have been mixing in your compost pile should give you a good grade of compost. Fresh hen droppings when applied to fairway turf are likely to burn if used in excess. By going over the fairways with a mat, as you suggest, it would be possible to break the material into finer particles, but you still might observe considerable burning. However, the grass would soon recover and you would get decided benefits from the manure. Probably you should make a trial of this material on a small scale until you have determined what

is a safe amount that can be used. We suggest that you apply it only at times when the grass is thoroughly dry and during cool weather, especially in early spring. If you could run the material through a shredder, you no doubt could distribute the material with less likelihood of burning. However, the cost would be greater and, after all, the small amount of burning you may experience may not be objectionable. There is also the likelihood of objections to the feathers and other litter on the course, but the final beneficial effect on the grass should offset this temporary inconvenience to the players.

Report of the 1937 Green Section Committee

FRANK M. HARDT, *Chairman*

DURING 1937 a large amount of correspondence was handled and many reports were made to member clubs on visits to courses and on materials submitted for examination, including samples of soils, grasses, fertilizers, seed, insects and peat. A considerable amount of technical information in literature was located for various clubs and organizations, and consultations were had with technical workers in the United States Department of Agriculture on special questions raised by club officials or through experimental work. Many conferences were held with greenkeepers and chairmen of green committees. A number of articles were prepared for golf magazines and publications interested in turf culture.

Dr. John Monteith, Jr., Chief of the Green Section staff, visited 59 clubs in 19 States from the Atlantic to the Pacific, attended the Fourth International Grassland Congress in Wales, and inspected turf improvement work in Europe.

During the visits to courses here a great variety of conditions requiring special attention were found, which included:

On Putting Greens

Problems arising from disease, insects, earthworms, rodents, weeds, poor physical condition of soil, layers of different materials, poor drainage, faulty watering methods, unsuitable grasses, improper fertilization, grain or nap, unsuitable topdressing methods, etc.

On Fairways and Tees

Problems arising from disease, insects, earthworms, rodents, weeds, poor or thin soil, faulty fertilizing practices, inadequate or excessive watering, unsuitable grass mixtures, poor drainage, etc.

Various tested methods for remedying the defects mentioned above were recommended. Ap-

proximately 2,000 letters were sent to member clubs with reports on courses visited, materials examined or methods advocated.

Experimental work at the Arlington turf garden was considerably expanded. The areas devoted to tests of various strains of putting green grasses as well as the old putting green fertilizer series which had to be abandoned a few years ago were planted again in the spring. A new series of plots was also planted to test the relative value of special strains of Kentucky bluegrass, fescue and rough bluegrass for use on tees and fairways. Another section was planted to test the merits of different strains of Bermuda grass and Zoysia grass. Experimental work on chemical weed-killers was continued this year at Arlington and on nearby golf courses. Experiments were conducted with new methods to destroy weed seed in compost.

Grasses

Various species and strains of grasses suitable for turf are tested at Arlington under comparable conditions. Most of these grasses were newly planted in turf this year and will have to be observed at least three years before we will feel safe in recommending them. The number of plots devoted to these tests is listed below:

Creeping bent	186
Velvet bent	117
Colonial bent	28
Kentucky bluegrass	48
Zoysia	25
Bermuda	8
Fescue	8
Poa trivialis	8
Timothy	2

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In addition to the above plots, a co-operative test has been planted by our staff on a local golf